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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/207,972

12/09/1998

MARK I. GARDNER

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7507

7590

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EXAMINER

WARREN, MATTHEW E

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 11/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/207,972

Applicant(s)

GARDNER ET AL.

Examiner

Matthew E Warren

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 February 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-18 and 20-50 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 16-18 and 20-41 is/are allowed.
- 6) ☒ Claim(s) 42-49 is/are rejected.
- 7) ☒ Claim(s) 50 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to the Amendment filed on February 9, 2004.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 42-44 and 46-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kizilyalli et al. (US 6,548,854 B1) in view of Wu (US 5,880,508).

Kizilyalli et al (fig. 1) a semiconductor device comprising a semiconductor substrate (2) and low trap density oxide layer (3) formed on the substrate (col. 3, lines 23-25). A high dielectric constant film (4), such as the metal oxide tantalum pentoxide, is formed on the oxide layer (col. 2, lines 56-67). Ta₂O₅ has a dielectric constant of which is greater than 5 or 20 as cited in the applicant's claimed invention. A gate conductor (6) is arranged on the high dielectric constant film. The silicon oxide film is less than about 10 angstroms thick (col. 2, lines 40-45). Kizilyalli et al. shows all of the elements of the claims except the low trap density layer (oxide layer) having nitrogen and the conductor arranged directly upon the high-K dielectric. Although Kizilyalli shows that the conductor (6) is arranged on an intervening oxide layer (5) and not directly on the high-K dielectric (4), it would have been obvious to one of ordinary skill in the art at the time the invention was made to remove the intervening oxide layer (5) of

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Kizilyalli and arrange the conductor directly on the high-K dielectric (4), since it has been held that omission of an element and its function in a combination where the remaining elements perform the same function as before involves only routine skill in the art. In re Karlson, 136 USPQ 184. Furthermore, Wu shows (fig. 5) that a conductor (10) is formed directly on a high-K dielectric layer (6). Wu also discloses (col. 1, lines 38-43) that the low trap density layer has nitrogen in it to reduce leakage currents in the layer. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the low trap density layer of Kizilyalli et al. by adding nitrogen as taught by Wu to suppress leakage current in the layer.

Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kizilyalli et al. (US 6,548,854 B1) in view of Wu (US 5,880,508) as applied to claim 42 above, and further in view of Chou (US 5,994,734).

Kizilyalli in view of Wu shows all of the elements of the claims except the additional gate dielectric and gate conductor formed between the nitrogen-containing oxide and the substrate. Chou shows (figs. 3f, 3g) a semiconductor device having an additional gate conductor layer (23) and a gate dielectric (22) formed between a dielectric stack and the substrate (20) to form a non volatile memory device. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the semiconductor device of over Kizilyalli in view of Wu by adding an additional gate conductor and dielectric as taught by Chou to form a non volatile memory device.

Allowable Subject Matter

Claim 50 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 16-18 and 20-41 are allowed.

The following is an examiner's statement of reasons for allowance: in re claim 16, the prior art references, alone or in combination, do not show a semiconductor device having the combination of a low trap density nitrogen containing oxide on a semiconductor substrate, a high-K dielectric having a dielectric constant greater than 5 arranged upon the high-K dielectric, and a dielectric having a dielectric constant greater than 20 arranged upon the high K-dielectric. In re claims 24 and 34, the prior art references, alone or in combination, do not show a semiconductor device having the combination of a low trap density nitrogen containing oxide on a semiconductor substrate, the nitrogen containing oxide having a thickness less than 10 Angstroms and high-K dielectric on the nitrogen containing oxide, wherein the high-K dielectric has thickness less than 10 Angstroms also.

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Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E Warren whose telephone number is (571) 272-1737. The examiner can normally be reached on Mon-Thur and alternating Fri 9:00-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEW

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November 15, 2004

Tom Thomas

TOM THOMAS
SUPERVISOR, PATENT EXAMINER
TECHNICAL STAFF, 2000